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POPULATION DYNAMICS OF KEY RAPTOR SPECIES IN THE KEVIN RIM AREA

Challenge Cost Share Progress Report 1997 and 1998 to
Bureau of Land Management
Great Falls District

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INTRODUCTION

The Kevin Rim escarpment complex in northern Toole County Montana provides important habitat for a variety of raptors (Dubois 1988). Because of exceptionally high nesting density, the Bureau of Land Management has designated the Kevin Rim a "Key Raptor Area" and "Area of Critical Environmental Concern" (Williams and Campbell 1988). Of additional significance is that the nesting population includes 3 high profile (key) species; ferruginous hawks *(Buteo regalis),* prairie falcons *(Falco mexicanus),* and golden eagles *(Aquila chrysaetos).*

Since 1988, several studies incorporating raptor productivity monitoring have focused on the Kevin Rim area (Dubois 1988, Harmata 1991, VanHorn 1993, Zelenak 1996, Harmata and Zelenak 1996). Consequently a comprehensive data base, consistent in focus, has been compiled on short- and long-term reproductive performance of the key 3 species nesting in the vicinity of Kevin Rim. Few other "Key Raptor Areas" have been monitored longer. However, in 1995 effort changed from intensive to extensive because of lack of funding. Monitoring was designed to obtain minimal productivity data and band over as many years as possible rather than expend funds over fewer years to collect all productivity statistics (i.e., occupancy, activity, clutch size). This report covers the 1997 and 1998 field seasons.

STUDY AREA

The Kevin Rim Raptor Study Area (KRRSA) contains the Kevin Rim, Rattlesnake Coulee, and Flats (Fig. 1). Kevin Rim (hereafter referred to as "the Rim") was considered the primary area for emphasis because ferruginous hawk surveys were complete each year KRRSA was visited between 1988 and 1996. In 1997, the Rim was divided into 4 districts (Fig. 1), all of which have been surveyed since 1988. Rattlesnake Coulee was covered intermittently as time and funds would allow during most, but not all years. A newly designated area, the Flats, is a triangular shaped area that extends from the eastern boundary of the Kevin Rim at its base to Oilmont at the apex, = 10 km east of KRRSA. The Flats has been cursorily inspected some years but not others. Recently (>1996), it has supported more, productive ferruginous hawk breeding areas.

OBJECTIVES

A. Determine number of successful breeding areas and young produced by 3 key raptor species nesting in KRRSA.

B. Band as many nestlings of 3 key raptor species as possible with federal bands and colorbands.

METHODS

Since 1995, available funds permitted only 3 days of field work plus travel and lodging each year. Study area visits were timed to provide as much data as economically as possible. Priority was directed to assessment of breeding success and determination of number of young produced. Nestling raptors of advanced age (∃b grown) were considered to survive to fledge.

Priority for survey and banding was directed at districts within the Rim (Fig. 1). All known nest sites were inspected while being vigilant to additional nests and adult pairs during travel and observation. Sequence and priority of visitation of districts on the Rim in 1997 and 1998 was: Badlands, North Rim, South Rim, Interior Valley. Next priority was of Rattlesnake Coulee. The Flats was inspected during travel to and from the Rim and Rattlesnake Coulee. All nests initially were inspected from ≥ 1 km with appropriate optics. Productive raptor nests and eyries (those containing advance young) were accessed by traditional repelling techniques. Use of an 3629 kg (8000 lb) vehicle winch saved time by allowing the bander to return to the top of the cliff immediately after banding at some sites. Nestling prairie falcons, ferruginous hawks, and golden eagles were banded with USFWS lock-on bands on the left leg. In 1997, 3 key species of nestling raptors also were banded with blue over silver metal pop-rivet bands on the right leg. In 1998, ferruginous hawks were banded with silver over blue metal pop-rivet bands (Fig. 2) on the right leg.

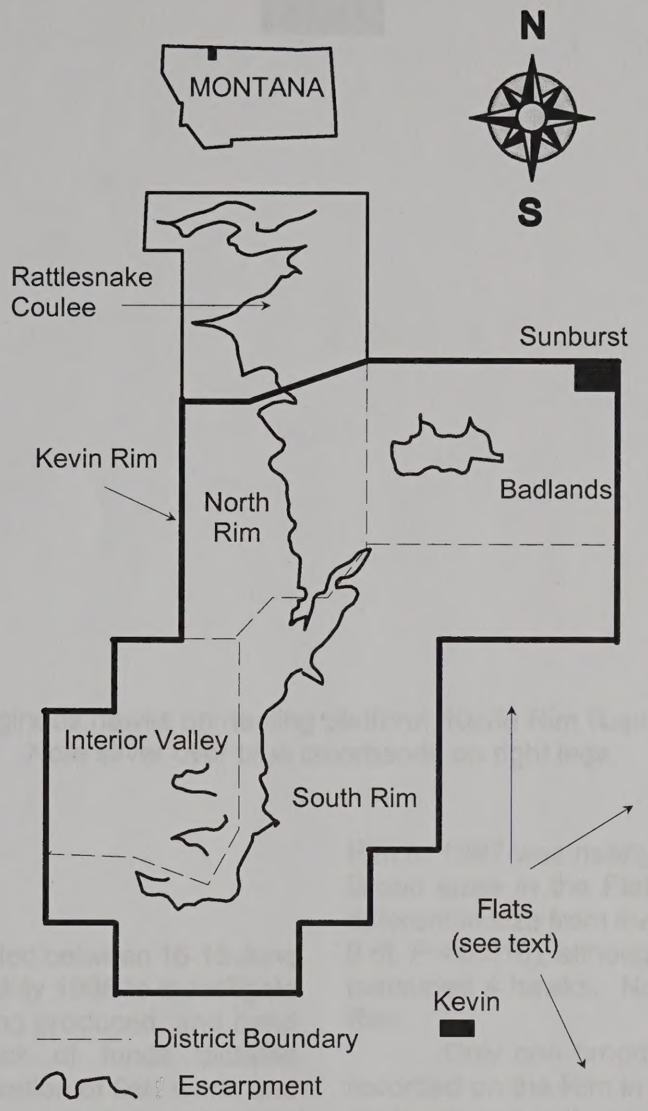

Figure 1. Kevin Rim Raptor Study Area, Toole County, Montana.

Figure 2. Nestling ferruginous hawks on nesting platform, Kevin Rim Raptor Study Area, 1998. Note silver over blue colorbands on right legs.

RESULTS

Breeding Success

KRRSA was visited between 16-18 June 1997, and 30 June - 2 July 1998 to investigate breeding success, young produced, and band nestling raptors. Lack of funds dictated priorities, timing and duration of field work, and precluded recording of all productivity parameters. Neither occupancy or activity were established for any species. Priority for monitoring was directed at ferruginous hawks.

Location of successful breeding sites (nests & eyries) and young produced by 3 key raptor species breeding in KRRSA in 1997 and 1998 are shown in Figures 3-6. Success of some prairie falcon pairs was not determined because time needed to locate active eyries or count nestlings would have prevented complete coverage of all ferruginous hawk sites in the Rim.

Ferruginous hawk brood size was not different for nests checked between 1997 and 1998 (Mann - Whitney U = 2.875, P = 0.641) (Table 1) but number of productive nests in the Rim in 1997 was nearly 75% lower than 1998. Brood sizes in the Flats were not statistically different in size from the Rim in 1998 ($t = -2.95$, 9 df, $P = 0.016$), although all broods in the Flats contained 4 hawks. None contained 4 on the Rim.

Only one brood of prairie falcons was recorded on the Rim in 1997 (Fig. 4), although at least one other eyrie may have been productive. One of 2 golden eagle pairs on the Rim produced I young in 1997. Inspections of prairie falcon eyries on the Rim were more complete in 1998, recording 5 eyries producing at least 15 young (Fig. 6). Both golden eagle pairs on the Rim were productive in 1998, fledging 1 young each. Two broods of ferruginous hawks and one brood of prairie falcons nesting on cliffs in the South Rim District in 1998 were infested with an avian tick *(Ornithodoros aquilae).* All looked debilitated (squinted eyes) but acted normal.

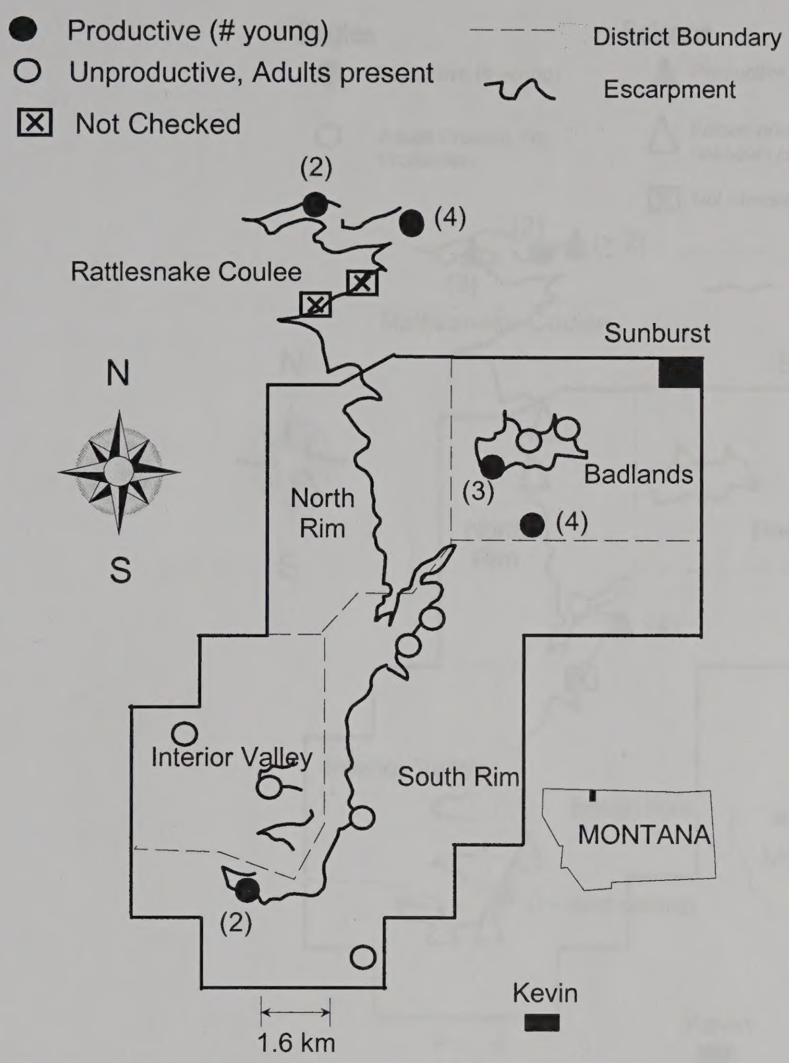

Figure 3. Productive ferruginous hawk breeding areas and young produced, Kevin Rim and Rattlesnake Coulee, 1997.

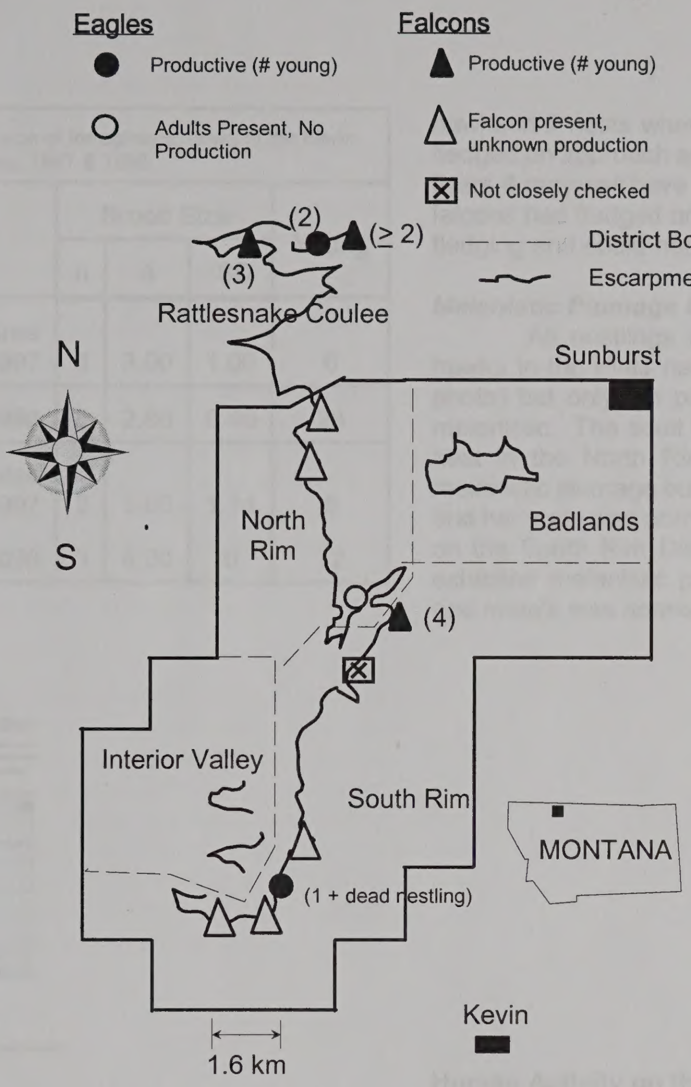

Figure 4. Golden eagle and prairie falcon productive breeding areas and young produced, Kevin Rim and Rattlesnake Coulee, 1997.

Table 1. Mean brood size of ferruginous hawks in the Kevin Rim Raptor Study Area, 1997 & 1998.

Area /Year	Brood Size			Young
	n	0	SD	
Primary Study Area 1997	3	3.00	1.00	6
1998	8	2.88	0.46	23
Rattlesnake Coulee 1997	2	3.00	1.14	6
Flats 1998	3	4.00	0	12

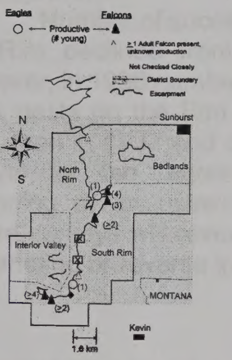

Figure 6. Golden eagle and prairie falcon productive breeding areas and young produced, Kevin Rim, 1998.

Banding

1997

A total of 12 ferruginous hawks, 2 American crows, one prairie falcon and 2 golden eagles were banded in 1997. Six ferruginous hawks were banded on the Rim and 6 in Rattlesnake Coulee. The golden eagles and prairie falcon also were banded in Rattlesnake Coulee. One productive prairie falcon eyrie entered on the South Rim (Fig. 3) contained nestlings too young to band. Crows were banded in the Flats.

1998

A total of 24 ferruginous hawks were banded in 1998. Two nestling golden eagles and 5 ferruginous hawks were not banded in due to advanced age. Entering the nest would have induced fledging of at least one of the nestlings. Eleven ferruginous hawk nestlings in the Flats were banded but a 12th was seen in a field 150 m from the nest and flew well on approach. Two other ferruginous hawks in 2 nests where their siblings were banded fledged on approach and could not be banded (good flyers & may well have previously fledged). All prairie falcons had fledged or were within one or 2 days of fledging and could not be banded.

Melanistic Plumage in Ferruginous Hawks

All nestlings in one brood of ferruginous hawks in the Flats had melanistic plumage (cover photo) but only the parent female's plumage was melanistic. The adult female at the only productive nest in the North Rim District (Fig. 5) also had melanistic plumage but plumage of both her progeny and her mate was normal. At the northern most nest on the South Rim District (Fig. 5), the adult male exhibited melanistic plumage while his 3 progeny and mate's was normal.

Human Activity on the Rim

Recent (1998) vehicle tracks in the grass on and below the escarpment on both public and private land were blatantly obvious in 1998. Density and extent of tracks were the most seen in 9 years of visits to the study area. Most were ATV (4 wheeler) and motorcycle tracks but large pickup-size or recreational Sport Utility Vehicle or "Jeep" size tracks also were evident. Some led directly to the escarpment edge directly over raptor eyries. Many were obviously just "dinkin' around" in the grass on public land on the escarpment. However, this activity was (and should not be) confused with legitimate activity of local landowners herding stock, who also use ATVs. One ferruginous hawk nest on the South Rim with the longest history of occupancy and productivity was vacant in 1998. Although the Rim directly over the nest is bare rock, vehicle tracks in the grass nearby indicated someone was over the nest earlier in the season, possibly causing the nest to fail. Additionally, one productive adult female

ferruginous hawk nesting on the Rim was missing of all secondary feathers on the left wing and the left half of her tail. This is not normal molt in ferruginous hawks and feather loss is consistent with gunshot damage seen in American rough-legged hawks *(Buteo lagopus)* (Olsen, C.V.,unpubl. data). Below the Rim on the east aspect, some Native American burial mounds and tepee rings had been disturbed (vandalized) since the 1997 field season.

Long-term Productivity of Ferruginous Hawks

Long-term productivity of ferruginous hawks was analyzed by preliminary and cursory inspection of number of successful nests present on the Rim over an II year period. A significant and strong negative correlation 7 =-0.81) of advancing year with number of successful nests was evident but 1998 success was higher than the trend (Fig. 7).

DISCUSSION

Number of successful ferruginous hawks on the Rim declined from 1988 to 1998 (Fig. 7). However, in 1998 number of successful ferruginous hawk nests on the Rim was 3 times greater than 1998 than in 1997 and above the 95% confidence interval for the regression; 1998 may be the beginning of an upswing in overall productivity. Future surveys will reveal if the trend will continue plummeting or reverse in a cyclic fashion.

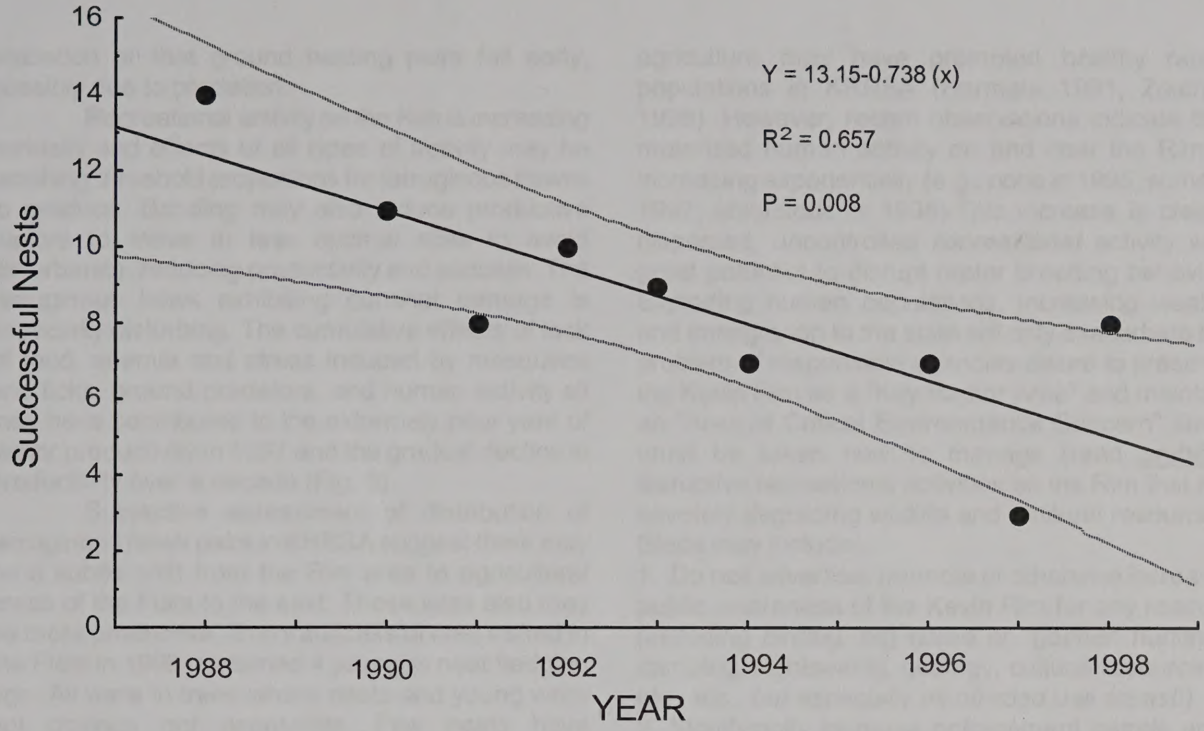

Figure 7. Regression of number of successful ferruginous hawk nests on the Kevin Rim District, Kevin Rim Raptor Study Area, 1988 to 1998.

Possible causes for declining productivity over the last decade may be lack of prey, weather, insects, predators, and human activity. Black-tailed jackrabbit *(Lepus califomicus)* jackrabbit numbers have declined precipitously since 1990. In 1990, up to 20 were seen on headlight surveys (Harmata 1991) and observations during diurnal research activities were not uncommon. None were seen during raptor surveys and banding from 1995 to 1997 and only one in 1998. Ground squirrel *(Spermophilus* spp.) observations, although not quantified, were obviously less than the late 1980s and early 1990s also, even though routes and timing of surveys and banding were similar.

The poorest production year on record for ferruginous hawks was 1997, the wettest experienced in KRRSA (pers. obs.). Young raptors in the first 1/3 of their nestling phase are notoriously sensitive to wet weather. Parent birds become less attentive to brooding as nestling age increases and rain at the wrong time will eliminate nestlings unable to thermoregulate when wet. Grasses in 1997 were taller than ever seen in 10 years of visits to KRRSA. Tall grass may have hidden ground squirrels and other terrestrially oriented prey from foraging hawks, reducing foraging success. Several wet years occurred in the mid-1990s. Additionally, during banding in 1997, mosquitos were in plague proportions, covering the bodies of banders and clearly stressing nestling hawks and falcons. Stress induced by mosquitos and/or avian tick infestations may have killed entire broods of young raptors before surveys each year.

Wild canid populations are the highest on record (Flath, D., Montana Dept. of Fish Wildlife & Parks, pers. comm. Cessation of aerial gunning has promoted population increases of coyotes (*Canis latrans*). Raccoons (*Protocyon lotor*) have recently invaded Montana and populations have exploded. Frequency of red fox *(Vulpes vulpes*) sightings have increased (Flath, D., Montana Dept. of Fish Wildlife & Parks, pers. comm., pers. obs.). These predators are well known to prey on ground nesting birds. In fact, up to 4 pairs of ground nesting ferruginous hawks have been recorded in KRRSA but only one was found in 1996 and none in 1997 and 1998. This may indicate a shift to elevated structures to avoid

predation or that ground nesting pairs fail early, possibly due to predation.

Recreational activity on the Rim is increasing annually and effects of all types of activity may be reaching threshold proportions for ferruginous hawks to produce. Banding may also induce productive raptors to move to less optimal sites to avoid disturbance, reducing productivity and success. The ferruginous hawk exhibiting gunshot damage is especially disturbing. The cumulative effects of lack of food, anemia and stress induced by mosquitos and ticks, ground predators, and human activity all may have contributed to the extremely poor year of raptor productivity in 1997 and the gradual decline in productivity over a decade (Fig. 6).

Subjective assessment of distribution of ferruginous hawk pairs in KRRSA suggest there may be a subtle shift from the Rim area to agricultural areas of the Flats to the east. These sites also may be more productive. Every successful nest visited in the Flats in 1998 contained 4 young at near fledging age. All were in trees where nests and young were not obvious nor accessible. Few nests have contained 4 young on the Rim in recent years. Nests in the Flats appear to be less affected by potential depressors; i.e., grazing intensity is higher cropping grasses, insects are fewer, few humans want to recreate in plowed fields or croplands, banding has occurred only recently, and nests are neither obvious nor as accessible as cliff sites on the Rim (target poor environment for gunners). Some ferruginous hawks may have occupied nests in the Flats in 1998 to avoid problems; or lack of stressors promoted productivity of resident pairs.

Prairie falcon and golden eagle production could not be adequately evaluated due to small sample size, but appeared normal at least to mid-nestling stage. However, tick infestation of eyass prairie falcons may have reduced fledging success. Tick induced mortality of prairie falcons usually occurs early in the nestling phase, generally before banding, but may occur later. Determining productivity of falcons by number of young of advanced age present during banding may result in over estimates of overall productivity during cycles of tick infestations. 0. *aquilae* also infest golden eagles but mortality is rare.

MANAGEMENT RECOMMENDATIONS

Previous research indicated human activity in the form of oil and gas extraction and pastoral agriculture may have promoted healthy raptor populations in KRRSA (Harmata 1991, Zelenak 1996). However, recent observations indicate that motorized human activity on and near the Rim is increasing exponentially **(e.g.,** none in 1995, some in 1997, ubiquitous in 1998).This increase is clearly dispersed, uncontrolled ***recreational*** activity with great potential to disrupt raptor breeding behavior. Exploding human populations, increasing wealth, and immigration to the state will only exacerbate the problem. If responsible agencies desire to preserve the Kevin Rim as a "Key Raptor Area" and maintain an "Area of Critical Environmental Concern" steps must be taken now to manage (read prohibit) disruptive recreational activities on the Rim that are severely degrading wildlife and cultural resources. Steps may include:

1. Do **not** advertise, promote or otherwise increase public awareness of the Kevin Rim for any reason (including birding, big game or "gopher' hunting, camping, sightseeing, geology, cultural resources, etc., etc., *but especially as off-road use areas!!)*
2. Significantly increase enforcement patrols and prosecution vandals and those that violate Rim access restrictions to the full extent of the law (no wrist slapping). "Education" doesn't work. It only takes one idiot to wipe out a years production or ruin context of cultural sites.
3. Prohibit ATV, trail bike, and four-wheel drive vehicles (except those of local stockmen managing herds, and other individuals authorized by *permit*) on any public land on top of the Rim and within 2 km of the base of the escarpment from I January to 30 August. This may require a commitment to fence and lock gates during that period.
4. Construct and place raptor nest platforms in strategic places away from the Rim in areas unattractive to the motorized recreationist to serve as refuges as human activity increases unabated on the Rim.
5. Fund impact analysis study of recreation, prey base, availability of alternate nest sites, and insects, and predation on raptor population dynamics that include:
    a. Recruitment and turnover rates in breeding ferruginous hawks, prairie falcons and golden eagles,
    b. Amount, type and timing of resource extraction, agricultural, and uncontrolled recreational human activity in KRRSA and evaluate effect on raptors,
    c. Abundance, distribution, and use of raptor prey base,

d. Surveys including other raptor nesting and foraging habitat adjacent to KRRSA in northern Toole County, e.g., Buckley Coulee, the Flats, escarpments to the west and south of KRRSA.

e. Effects of *Ornithodorus aquilae* infestations on 3 key species.

f. Efficacy of nest platforms for management of raptor distribution and productivity.

1999 PLANS (without additional funding)

Limited funds dictated priorities and frugality in 1995-1998. Field activities were minimized to maximize efficiency to insure that some funds were available to maintain continuity in effort to the year 2000 (5 yr. colorbanding originally proposed). Small budget was consumed with colorband cost, mileage, per diem, and equipment. Larger expenditures are expected during 1999-2000. Emphasis on production survey and colorbanding will exhaust the existing balance by the mid 1999 field season. Further effort will require additional funding.

Funds currently available will allow a maximum 2 day field effort in 1999. In addition to banding all possible young within time constraints, attempts will be made to obtain production of at least ferruginous hawks. Dusting all nest sites and eyries with Sevin™ during banding could increase numbers of young fledged, especially prairie falcons.

Three cohorts totaling 65 of ferruginous hawks have been colorbanded at KRRSA. It is now time to begin intensive observations of breeding adults at nest sites to determine band status and investigate recruitment and turnover rates over succeeding years, especially considering the potential retreat of ferruginous hawks away from the Rim to the Flats. To maximize data return, additional funding is required. A full time field tech would visit the Rim in late March- early April for I week to record occupancy of key raptor breeding areas and determine band status of resident adults. He would return in early May to record activity and continue to investigate band status of adults. In late June, a 3 member field team will return to record productivity, band nestlings, and continue to investigate band status of adults. All visits will require per them and mileage. One field tech will require a salary ($1786/mo. for I 2 mos.). $30,000 would cover field effort until the 2005. Additionally, a program to construct, place, and monitor nest platforms should be implemented. Platforms strategically placed may induce raptors to nest closer to prey concentrations and shielded from shooters and motorized recreationists.

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